



Contribution ID: 673

Type: **not specified**

P2.101 Busbar Monitoring System of the ITER DC Busbars

Tuesday, 18 September 2018 11:00 (2 hours)

In ITER, DC busbars will be used to connect the AC/DC converters to the superconducting coils of the magnet system and will run from buildings B32, B33 through building B74 to TOKAMAK building B11; the total length will exceed 5 km. The busbars will be interconnected by flexible links for thermal expansion compensation.

The busbars used in the TF, PF/CS and CC coil power supply systems are rated for the continuous current up to 68 kA, 55 kA and 10 kA respectively. The busbars will be cooled by deionized water through inlet and outlet cooling water collectors (CWC). The water flow rate and temperature will be measured by sensors installed in outlet CWCs. Reduction or loss of cooling water flow might cause excessive heating of the busbar conductors and, in extreme case, damage their insulation. To prevent this, the Busbar Monitoring System (BBMS) was developed at the Efremov Institute for continuous monitoring of thermal conditions of the busbars during operation with a polling frequency of 1 Hz.

BBMS is composed of two independent subsystems, namely, one subsystem collects data from the CWCs, the second one measures temperature of the flexible links surface by fiber optic temperature sensors (FOTS). The CWC data acquisition subsystem is related to the Interlock system, and in case the water cooling system fails it automatically generates event for controllable interruption of the plasma pulse. The FOTS data acquisition subsystem is used for back-up diagnostics of the busbar cooling conditions and for estimation of condition of the contacts between the busbar sections and flexible links.

This paper presents the architecture of BBMS after a short description of the ITER DC busbar system. Special attention will be paid to the detailed description of the BBMS components and results of their testing, as well as to the software description.

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Session Classification: P2